Dissection of the Distal Vertebral Artery Treated by Modified Parent Artery Trapping and a Contralateral Stent Barricade

A Case Report

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Summary

Endovascular trapping is the preferred treatment method for a vertebral dissecting aneurysm. We describe a case of ruptured dissecting aneurysms located just proximal to the vertebrobasilar junction treated by trapping the dissecting segment and barricading the basilar artery with a stent to protect against coil protrusion. Modified parent artery trapping with a stent barricade allows preservation of the adjoining confluent zone or side branch during endovascular trapping of the vertebral dissection.

Introduction

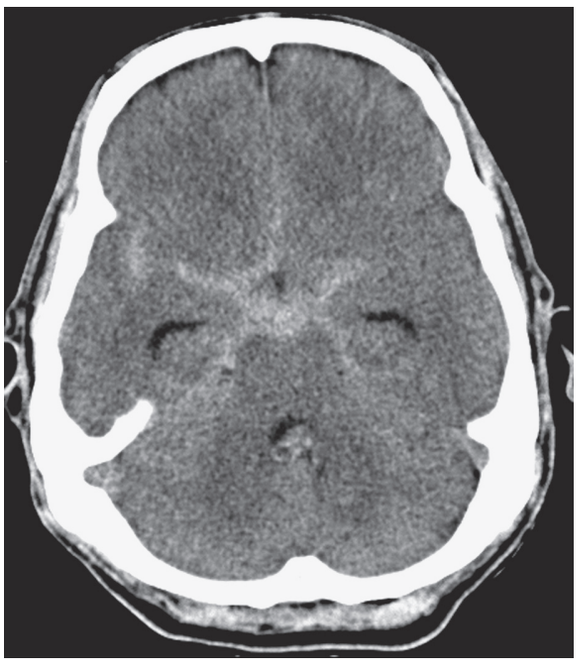
Ruptured vertebrobasilar dissecting aneurysms are associated with a high incidence of rebleeding that results in a high mortality rate [1]. Thus, early treatment is strongly recommended. Current surgical treatments include proximal clipping, wrapping, or trapping of the lesion. However, surgical approaches can carry a risk of serious morbidity.

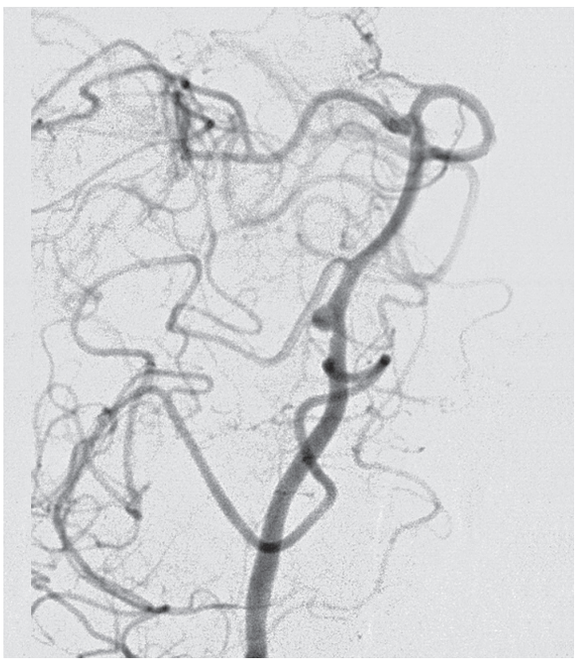
Endovascular trapping of the dissecting segment has been advocated as the treatment choice due to good lesion access and a high treatment success rate. When dissection may involve the posterior inferior cerebellar (PICA) origin or collateral blood flow is insufficient to allow parent vessel sacrifice, endovascular trapping is not feasible [2]. In addition, coil protrusion or migration into other non-pathological vessels may lead to thromboembolic complications, because coil packing within parent arteries may be difficult to manipulate in it rather than a saccular aneurysm embolization.

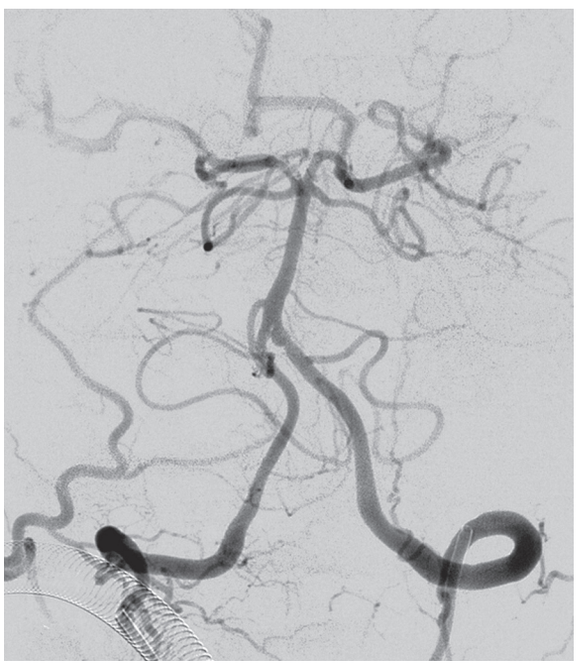
We describe a case of ruptured dissecting aneurysms located just proximal to the vertebrobasilar junction that was treated by trapping of the dissecting segment and barricading the basilar artery against coil protrusion through the use of a stent.

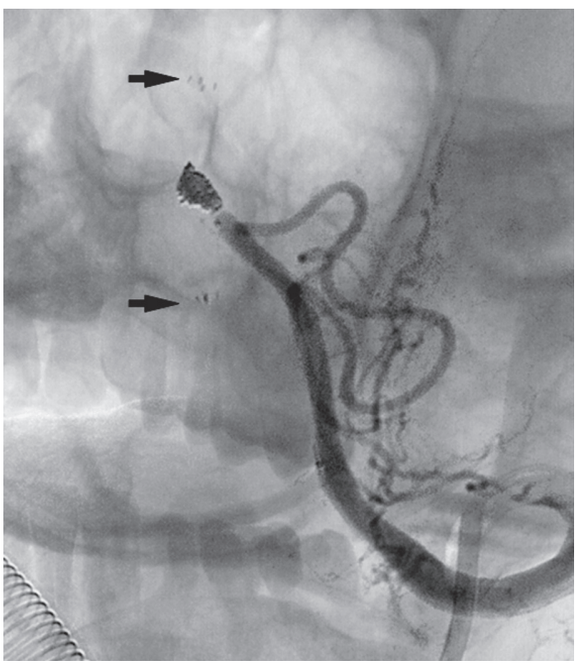
Case Report

A 48-year-old man was admitted to our hospital with a severe headache that had persisted for three days. His CT scan revealed a Hunter and Hess grade IV subarachnoid hemorrhage that was mostly present in the prepontine cistern (Figure 1A). CT angiography revealed a fusiform aneurysm involving the terminal intracranial segment of the left vertebral artery, just proximal to the vertebrobasilar junction and distal to the origin of the left posterior inferior cerebellar artery. Because of the favorable anatomic conditions in the dissected vessel segment, we chose to treat with endovascular management. Because the aneurysm was too close to the vertebrobasilar junction, simple trapping by coils may have led to coil protru-









sion into the basilar artery. Therefore, we planned a modified endovascular trapping method in which the right vertebral artery and basilar artery were protected from coil protrusion by a self-expanding stent. According to our hospital's protocol for intracranial stent placement, clopidogrel (300 mg) and aspirin (325 mg) were administered orally two hours before the procedure. The procedure was performed with the patient under general anesthesia. At the start of the procedure, the patient received a heparin bolus (5,000 IU) flushed with saline and heparin (1 U heparin per mL of isotonic sodium chloride solution at a rate of 100 mL/h). A 5F guiding catheter (Cordis Envoy; Johnson and Johnson Medical, Miami

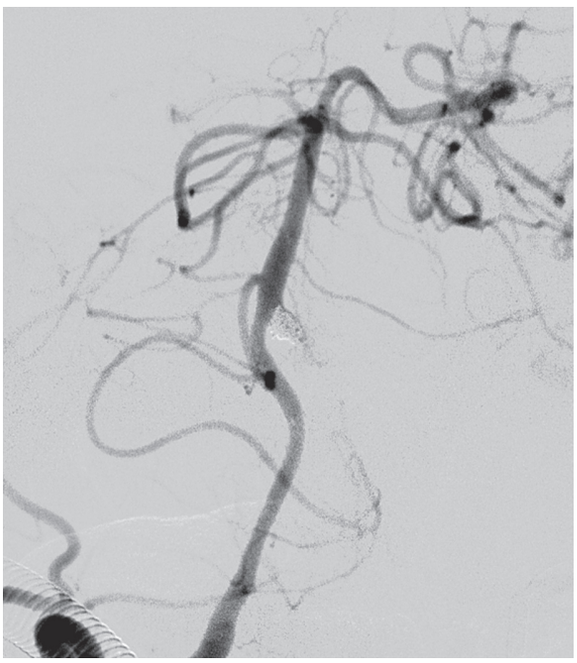


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Figure 1 A) Transverse CT scan obtained on the day of admission. Blood is present within the prepontine subarachnoid space. B,C) Oblique view of left vertebral arteriography and AP view of simultaneous bilateral vertebral arteriography reveal dissecting aneurysm arising from the left vertebral artery. The dissecting segment is located just proximal to the vertebrobasilar junction. The distance between the left vertebral artery terminus and the PICA origin is significantly short. D) Left vertebral arteriography demonstrates complete occlusion of the aneurysm with a patent left distal VA. The Markings of stent deployed in right vertebral artery and basilar artery are shown (arrows). E) Right vertebral arteriography reveals excellent blood flow within the right vertebral artery and basilar artery. A stent implant in the right vertebrobasilar junction successfully barricades against coil protrusions in the left vertebral artery.

Lakes, FL, USA) was positioned as high as possible into the right vertebral artery. In addition, a 6F guiding catheter was positioned into the left vertebral artery. Upon simultaneous bilateral vertebral arteriography, the dissecting aneurysm was just proximal to the vertebrobasilar junction and the orifice of PICA was located immediately proximal to the dissecting segment. The segment available for sacrifice, the distance between the left vertebral artery terminus and the PICA origin, was less than 3 mm, which was significantly short (Figure 1B). The aneurysmal dome measured 3x2.5 mm with a 3 mm neck, and its proximal segment had an irregular lumen. The pathologic segment of the left vertebral artery was also less than 10 mm long. A 4x20 mm Neuroform stent (Boston Scientific/Target Therapeutics, Inc., Natick, MA, USA) was deployed via guiding catheter into the right vertebral artery, covering the distal right vertebral artery up to the proximal basilar artery and terminus of the left vertebral artery (Figure 1C). A microcatheter (Excelsior SL-10; Boston Scientific) was carefully positioned within the dissecting segment via a guiding catheter in the left vertebral artery and the dissecting aneurysm and parent artery were trapped with four detachable platinum coils. The stent was an effective fence to protect against coil mesh protrusion over the terminus of the left vertebral artery during the procedure. Despite the short length of the trapping segment, the lumen of the aneurysm, including the dissected vertebral segment, was completely occluded with coils on control angiography (Figure1D). The left PICA was preserved and the flow within the right vertebral and basilar artery was preserved (Figure 1E). After the procedure, the patient received clopidogrel (75 mg twice daily) and aspirin (325 mg daily). The patient was discharged eight days later without any complications.

Discussion

There are several options for the endovascular management of dissecting aneurysms as an alternative to parent artery trapping, such as using a double stent, stent assisted coil, or proximal occlusion [3-5]. These methods offer the advantage of parent vessel preservation, which obviates the need to consider whether collateral blood flow is sufficient to allow parent vessel sacrifice without neurologic deficit. However, there are still questions on the safety of these procedures because radiologic complete occlusion is not always possible by these methods, and incomplete occlusion involves the additional risk of rebleeding. Results of multiple series suggest that endovascular trapping to directly occlude the pathologic artery segment is appropriate in vertebral dissecting aneurysms.

Parent vessel occlusion is considered the first option for treatment in patients who can tolerate sacrifice of the parent vessel along its diseased segment.

Endovascular parent vessel trapping has some limitations. Dissecting segments in the PICA origin or the sacrifice of the vertebral artery can lead to hemodynamic insufficiency. In these cases, other modified methods should be considered for treatment [1]. Also, the length of the segment treated using endovascular techniques is not controllable and is generally longer than the anticipated length, because coils commonly pack loosely in the parent artery. In the case of a ruptured aneurysm in the supra PICA level, the possibility of unwanted coil packing below the PICA or over the distal end of pathologic segment is always present [3]. To overcome these technical limitations, we have sometimes used the double catheter technique for parent artery trapping.

Despite this pitfall, endovascular trapping can be regarded as a standard treatment for vertebral dissecting aneurysms due to good lesion access and acceptable procedure-related complication rates.

In our case, the "stent barricade" of the contralateral artery has some merits compared to the conventional method of coil packing only. First, the stent could protect against coil protrusion or migration into the basilar artery during vertebral artery coil trapping. Second, the coil could be densely packed within the parent artery, and the sacrificing of segment could be shortened, because the stent barricade places the parent artery in the blind pouch. Third, the stent mesh itself might effect flow diversion.

Conclusion

The endovascular treatment of dissecting vertebral artery by modified parent artery trapping and a stent barricade allows for preservation of the adjoining confluent zone or side branch. This method could apply to the treatment of the supra PICA dissection with short segments, such as our case, and the infra PICA dissection with protection of the PICA.

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